

Korean CAREX, we focused on estimating the exposure intensity of lead across industries, which is a suspected carcinogen. **Methods** We extracted airborne lead measurements from the work environment measurement database (WEMD) which is the Korean nationwide measurement database. In addition, we elicited the experts' opinion about lead exposure intensity across industries by conducting a questionnaire. Experts provided estimates of lead exposure levels as the boundary of the 5th and 95th percentiles. We assumed that experts provided their estimates based on the assumption of log-normal distributions of exposure. First, for each industry, estimates of log-transformed geometric means (logGM) and log-transformed geometric standard deviations (logGSD) were extracted from the experts' responses, followed by combining them to quantify the experts' prior Normal-Inverse-Gamma prior distribution. Then, the corresponding logGM and logGSD from lead measurement data for each industry were updated with the experts' prior distribution through a Bayesian framework, yielding posterior distributions of logGM and logGSD.

Results WEMD contains 83 035 airborne lead measurements collected between 2002–2007. Total 17 occupational hygiene professionals with more than 20 year experience provided lead exposure estimates. In industries where measurement data is abundant, the measurement data dominate the posterior exposure estimates, while in industries with a limited number of measurements, experts' opinion played an important role in determining posterior exposure estimates. For example, rubber manufacturing industry with 246 measurements (GM 1.72; GSD 1.94) and 6 experts' responses (GM 0.79; GSD 6.73) showed posterior exposure estimates of GM 1.60 and GSD 2.34.

Conclusions Our method of estimating the exposure intensity of CAREX may introduce an unbiased approach to the development process by utilising both prior knowledge of experts and measurement data simultaneously. In addition, it will supply a framework for future updates.

1132 ESTIMATION OF LEAD EXPOSURE PREVALENCE IN KOREAN POPULATION THROUGH COMBINING MULTIPLE EXPERTS' JUDGMENT BASED ON OBJECTIVE DATA SOURCES

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Objectives Estimation of exposure prevalences of carcinogens is important for preventing occupational cancers. For developing Korean CAREX (CARcinogen EXposure) which is a carcinogen surveillance system employed in many countries, as an exemplary carcinogen, we estimated lead exposure prevalences in Korean working population.

Methods We used three nationwide data sources to retrieve objective default estimates of lead exposure prevalence across industries: the work-environment monitoring database (WEMD), the special health examination database (SHED), and the Work Environment Condition Survey (WECS).

Furthermore, we surveyed experts for their judgment about lead exposure prevalence across industries after reviewing the default estimates computed from aforementioned three exposure databases. We developed various estimation methods combining experts' judgment, and then compared with each other. The 2010 Census was used as the reference population to estimate the number of lead-exposed workers for the 228 industries through multiplying the exposure prevalence with the number of workers in each industry.

Results Default estimates of exposure prevalence for 228 industries were calculated using the WEMD and SHED collected between 2009–2011, and the 2009 WECS. A total of 52 experts who have 20 or more experience in industrial hygiene practice participated in the study and provided their judgment on the lead exposure prevalences as a number for the 228 industries. Among various estimation methods, the median values of experts' responses were selected for our estimates of lead exposure prevalence in each industry. As a result, a total of 129,247 Korean workers was estimated to be exposed to lead in the year of 2010.

Conclusions We developed a method estimating exposure prevalences combining experts' judgment based on objective databases. Our effort for estimating the exposure prevalences of CAREX may introduce an unbiased approach to the development process accounting for uncertainty of exposure.

1154 BIG DATA AND OCCUPATIONAL HEALTH SURVEILLANCE: USE OF FRENCH MEDICO-ADMINISTRATIVE DATABASES FOR HYPOTHESIS GENERATION REGARDING OCCUPATIONAL RISKS IN AGRICULTURE

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Introduction Surveillance of diseases and associated exposures is a major issue in occupational health, especially for identifying new work-related diseases. In addition to classical epidemiology (hypothesis-driven studies), complementary methods relying on data mining of health insurance data must be developed for early detection of work-related diseases, without prior hypothesis.

Methods Data from the insurance fund of French agricultural workers ('Mutualité Sociale Agricole', MSA), which covers about 3 million individuals, were considered. The study population included all self-employed or employee affiliates from the 2006–2015 period. MSA holds medico-administrative databases, which include information on occupational activities as well as long-term diseases identified with ICD-10 codes. Following authorisation of MSA and of the French National Commission on Informatics and Liberty, these databases were cross-linked for the first time. After preliminary data treatments, generalised linear models and latent factor models were applied to detect over-represented statistical associations between occupational activity and long-term disease. Results were represented as p-value plots in order to highlight the key statistical signals.

Results The population covered by this study accounted for more than 2 million individuals (n=2,250,177) with a majority of men (64%) and an average age of 46 years. Within this

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population, 2 45 748 individuals were reported with long-term diseases. Key statistical signals are presented for several disease groups (respiratory, neoplasms, neurodegenerative, etc).

Discussion The approach presented had the following advantages:

- enabling systematic evaluations of all disease – occupational activity associations,
- high statistical power, and
- costless data acquisition.

The main drawback is its lack of direct information regarding exposure. For this reason, further work is currently performed to estimate exposure to pesticides retrospectively relying on other databases. This data mining approach will later be enriched by identifying diseases using the medical-related expense databases (including information on medications, biological exams, etc).

1159 OCCUPATIONAL RISKS FOR MIGRANT WORKERS IN SPAIN

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Introduction Migrant populations appear to be in general at greater risk than native populations for developing a number of diseases. However, the health and safety environments for these migrant populations are scarcely studied. The objective of this study is to compare the prevalence of risk exposures between migrant workers and Spain-native workers in Spain.

Methods Information gathered through the ongoing Platform of Longitudinal Studies of Immigrant Families (PELFI; started 2015) provides insight into the different kinds of health and safety risks that migrant and Spain-native workers experience. For the present study, migrants from Colombia, Morocco, and Ecuador, as well as Spanish controls make up a cohort of 473 workers. Data on socio-demographic variables (age, sex, and type of job) and self-reported occupational exposures were collected through face-to-face interview. Analysis of specific risks to worker health and safety focused on [1] frequency of exposure to chemical, psychosocial, and ergonomic hazards, and [2] employment arrangements. Data were analysed using STATA.

Results The overall frequency of hazardous exposure was consistently higher for migrants when compared to Spain-native workers. PELFI results show significant differences ($p<0.05$) between migrant and Spain-native workers for occupations involving heavy lifting (38.85% migrants; 19.35% natives), high heights (16.35%; 3.30%), repetitive movements (81.58%; 59.78%), chemical products (50.76%; 18.28%);), experiencing pain as a result of the work (59.39%; 1.57%), and standing long hours (67.68%; 19.35%). 26.32% of migrant workers and 15.48% of Spain-native workers reported that their salaries were insufficient to cover unexpected expenses.

Conclusion Migrant workers in this study are more frequently exposed to occupational risks than Spain-native workers. Although limitations exist regarding participants' different perceptions of risk, results suggest that special attention must be paid to migrant workers in Spain. A promising area for future research seeks to understand the processes by which workers are differentially exposed to occupational risks.

1206 APPLICATION OF METABOLOMIC SCIENCE IN THE DETECTION OF LUNG CANCER: A CASE-CONTROL STUDY

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Introduction Lung cancer is the leading cause of cancer death in the world. The challenge of screening for early stage lung cancer is still unresolved. The exploration of metabolites in breathe using sensor array technique may become a powerful screening tool to solve the problem.

Methods We conducted a prospective study to enrol cases of lung cancer and controls who received surgery for gall bladder stone, hernia, hemorrhoid resection, and thoracoscopic surgery in the same hospital between July 2016 and June 2017. The alveolar air of subjects were collected under the guidance of mainstream carbon dioxide analyzer. An electronic nose composed of 32 carbon nanotubes sensors was used to measure the VOCs of the alveolar air. The diagnostic accuracy was analysed by linear discriminant analysis (LDA) using the pathological reports as the reference standard.

Results After excluding 2 subjects with technical problems in sampling, 12 subjects with cancers in other sites, benign lung tumour, or metastatic lung cancer, 5 subjects received chemotherapy, 5 subjects with diabetes, 2 subjects with asthma, and 2 subjects with chronic obstructive pulmonary disease, a total of 17 cases and 105 controls were used in the final analysis. We randomly split the data into 80% for model building (training set) and 20% for validation (test set). By LDA, the accuracy, sensitivity, specificity, false positive rate, false negative rate, and ROC-AUC were 96.9%, 75.0%, 100.0%, 0%, 25%, and 0.98 (95% CI: 0.96 to 1.00) in the training set, and 84.0%, 80.0%, 85.0%, 15.0%, 20.0% and 0.84 (95% CI: 0.62 to 1.00) in the test set.

Conclusion The use of sensor array technique to explore the metabolites in breathe may become a powerful tool in the screening for lung cancer. Standardised procedures to eliminate confounding factors are warranted before clinical application.

1222 DIAGNOSIS OF 1,561 COMPENSATED CASES FOR OVERWORK-RELATED CEREBROVASCULAR/CARDIOVASCULAR DISEASES (CCVDs) KNOWN AS 'KAROSHI' IN JAPAN, 2010–2014

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Introduction Overwork-related health disorders including cerebrovascular/cardiovascular diseases (CCVDs) and mental disorders, known as 'Karoshi', have been the keen occupational health issue. Main criteria applied for compensation of overwork-related CCVDs in Japan were (1) extraordinary events,